CLAIMS

[1] A surface coated member, comprising a substrate, a lower layer composed of at least one layer and coated on the surface of the substrate, and an upper layer composed of at least one layer and coated on the surface of the lower layer,
wherein when F_U stands for a peeling load under which the upper layer starts to peel away from the surface of the lower layer and F_L stands for a peeling load under which the lower layer starts to peel away from the surface of the substrate, the ratio (F_L/F_U) is 1.1 to 30.

[2] The surface coated member according to claim 1, wherein the peeling load (F_U) is 10 to 75N and the peeling load (F_L) is not less than 80N.

[3] The surface coated member according to claim 1, wherein interface roughness R in the interface between the upper layer and the lower layer that is figured out based on the method of arithmetical mean surface roughness (Ra) from irregular shape is 0.5 to 3.0 μm.

[4] The surface coated member according to claim 1, wherein the upper layer has a film thickness of 2.0 to 10.0 μm and the lower layer has a film thickness of 3.0 to 15.0 μm.

[5] The surface coated member according to claim 1, wherein the upper layer has at least one aluminum oxide layer, and the lower layer has at least one titanium carbonitride layer.

[6] The surface coated member according to claim 5, wherein the titanium carbonitride layer is composed of columnar titanium carbonitride crystals which have grown in a direction vertical to the surface of the substrate, and the mean crystal width of the columnar titanium carbonitride crystals on the aluminum oxide layer side is larger than the mean crystal width on the substrate side.

[7] The surface coated member according to claim 6, wherein a mean crystal width w_1 on the substrate side is 0.05 to 0.7 μm, and the ratio (w_1/w_2) of the mean crystal width w_1 on the substrate side to a mean crystal width w_2 of the columnar titanium carbonitride crystals on the aluminum oxide layer side is not more than 0.7.

[8] The surface coated member according to claim 6, wherein the titanium carbonitride layer is composed at least of a titanium carbonitride upper layer coated on the aluminum oxide layer side and a titanium carbonitride lower layer coated on the substrate side, and the mean crystal width of the titanium carbonitride upper layer is larger than that of the titanium carbonitride lower layer.

[9] The surface coated member according to claim 8, wherein the titanium carbonitride lower layer has a film thickness t_1 of 1.0 to 10.0 μm, the titanium carbonitride upper layer has a film thickness t_2 of 1.0 to 5.0 μm, and the relation of $1 < t_1/t_2 \leq 5$ is satisfied.

[10] The surface coated member according to claim 8, wherein when the titanium carbonitride lower layer is viewed from the surface direction, the titanium carbonitride lower layer is composed of the aggregate of acicular titanium carbonitride particles, and the acicular titanium carbonitride particles respectively grow in a random direction on the surface of the titanium carbonitride lower layer.

[11] The surface coated member according to claim 10, wherein the acicular titanium carbonitride particles have an average aspect ratio of not less than 2 when observed from the surface direction of the titanium carbonitride lower layer.

[12] The surface coated member according to claim 10, wherein the acicular titanium carbonitride particles have an average long axis length of not more than 1 μm when observed from the surface direction of the titanium carbonitride lower layer.

[13] The surface coated member according to claim 5, wherein at least one of a surface layer coated on the uppermost surface of the upper layer, a middle layer coated on the bottommost surface of the upper layer and a base layer coated on the surface of the substrate in the lower layer is a coating layer composed of one or more layers selected from the group consisting of TiN layer, TiC layer, TiCNO layer, TiCO layer and TiNO layer.

[14] The surface coated member according to claim 5, wherein at least one of the titanium carbonitride layer and the aluminum oxide layer is composed of two or more layers, and one or more layers selected from the group consisting of TiN layer, TiC layer, TiCNO layer, TiCO layer and TiNO layer are coated between the two or more layers.

[15] The surface coated member according to claim 5, wherein the aluminum oxide layer has α(alpha)-type crystal structure.

[16] A surface coated member, comprising a substrate and a hard coating layer, the hard coating layer including a titanium carbonitride layer coated on the surface of the substrate and an aluminum oxide layer coated on the surface of the titanium carbonitride layer,
wherein the titanium carbonitride layer is observed at the periphery of the substrate exposed in a depression having a spherical surface, which is formed in the hard coating layer so as to expose the titanium carbonitride layer of the hard coating layer and the substrate, by rotating a hard ball on the surface of the hard coating layer and partially wearing down the contact point of the hard ball in the hard coating layer; and has a lower structure having no or few cracks, and an upper structure observed at the periphery of the lower structure and having higher density of cracks than the lower structure.

[17] A surface coated member, comprising a substrate and a hard coating layer, the hard coating layer including at least a titanium carbonitride layer coated on the surface of the substrate and an aluminum oxide layer coated on the surface of the titanium carbonitride layer,
wherein the titanium carbonitride layer is composed of a multilayer including a lower titanium carbonitride layer having no or few cracks, and an upper titanium carbonitride layer observed around the lower titanium carbonitride layer and having higher density of cracks than the lower titanium carbonitride layer, when observing the periphery of the substrate exposed in the depression according to claim 16.

[18] The surface coated member according to claim 17, wherein the lower titanium carbonitride layer has a film thickness t_3 of 1 μm $\leq t_3 \leq$ 10 μm, the upper titanium carbonitride layer has a film thickness t_4 of 0.5 μm $\leq t_4 \leq$ 5 μm, and the relation of $1 < t_3/t_4 \leq 5$ is satisfied.

[19] The surface coated member according to claim 17, wherein titanium carbonitride particles in the lower titanium carbonitride layer and the upper titanium carbonitride layer grow vertically to the surface of the substrate and have a columnar structure, and the mean crystal width of the titanium carbonitride particles constituting the upper

titanium carbonitride layer is larger than that of the titanium carbonitride particles constituting the lower titanium carbonitride layer.

[20] The surface coated member according to claim 19, wherein the upper titanium carbonitride layer has a mean crystal width w_4 of 0.2 to 1.5 μm and the ratio (w_3/w_4) of a mean crystal width w_3 in the lower titanium carbonitride layer to the mean crystal width w_4 of the upper titanium carbonitride layer is not more than 0.7.

[21] The surface coated member according to claim 17, wherein the lower titanium carbonitride layer and the upper titanium carbonitride layer are represented as Ti ($C_{1-m}N_m$), and the lower titanium carbonitride layer meets the condition of m=0.55 to 0.80 and the upper titanium carbonitride layer meets the condition of m=0.40 to 0.55.

[22] A cutting tool for performing cutting by putting on a workpiece material a cutting edge that is formed on the cross ridge portion of a rake face and a flank face, wherein the cutting edge comprises the surface coated member according to claim 1.

[23] A cutting tool comprising a substrate, a titanium carbonitride layer coated on the surface of the substrate and an aluminum oxide layer coated on the surface of the titanium carbonitride layer,
wherein when F_U stands for a peeling load under which the aluminum oxide layer starts to peel away from the surface of the titanium carbonitride layer and F_L stands for a peeling load under which the titanium carbonitride layer starts to peel away from the surface of the substrate, the peeling load F_U is 10 to 75N, the peeling load F_L is not less than 80N, and the ratio (F_L/F_U) is 1.1 to 30.

[24] A cutting tool for performing cutting by putting on a workpiece material a cutting edge that is formed on the cross ridge portion of a rake face and a flank face, wherein the cutting edge comprises the surface coated member according to claim 16 or claim 17.